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Integrity Management for Wrinklebends and Buckles #132
Contract Number: DTRS56005-T-0003
Quarterly Report
June 1– August 31, 2005
Battelle

In this period, we investigated the pipeline steel grade influence on the wrinklebend criteria using finite element analysis (FEA) based on the cyclic internal pressure loading of 10% to 72% SMYS, and then extended the criteria to cover pipeline steel grades from B to X60. Results show that the pipeline grades have significant effect on the wrinklebend criteria, and the higher grade has less service life for a specific wrinkle size. To develop a reasonable operation-specific criterion, a more realistic hardening model was employed so as to consider the Bauschinger effect and anisotropy induced by work hardening, which included a pure kinematic hardening model and a combined kinematic and isotropic hardening model as built in ABAQUS. In addition, three energy-based fatigue damage parameters were used and determined to validate one so as to effectively quantify the wrinklebend integrity under cyclic loading of the internal pressure.